Supporting Information


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This Supporting Information contains 6 pages, 4 figures, including this cover sheet.
FIGURE S1. The comparison between measured $R_{s,\text{monthly}}$ and simulated $R_{s,\text{monthly}}$ of terrestrial ecosystems in China (a, c: TP; b, d: TP2; ●: Forest; ○: Grassland; ▼: Cropland). The data in Fig. S1c and Fig. S1d were the averaged values of the same type of ecosystem in the same site in Fig. S1a and Fig. S1b, respectively.

The ability of TP model for estimating the spatio-temporal variability of $R_{s,\text{monthly}}$ was tested using the 333 collected monthly mean $R_s$ data. The values of parameters are $R_0 = 1.250$, $Q = 0.055$, and $K = 4.25$. The results show that the coefficient of determination between the simulated and measured $R_s$ values was only 0.37 with considerable systematic error (Fig. S1a). Therefore, TP model was reparameterized using the collected data. The model modified with new parameter values ($R_0 = 1.740$, $Q = 0.029$, $K = 0.911$) is referred to as TP2 model. However, TP2 model could only explain 40% of the spatio-temporal variability of the monthly mean $R_s$ showing
limited improvement in the systematic error (Fig. S1b). It is obvious that neither the
original TP model nor the reparameterized TP model (i.e. TP2 model) could well
explain the spatial variability of $R_{s,\text{monthly}}$ in China (Fig. S1a,b). Figure S1c and S1d
shows the relationship between the averages of the measured and predicted $R_{s,\text{monthly}}$
of the same ecosystem.
FIGURE S2. The capability of GSMSR for explaining the seasonal variation of $R_s$ in different terrestrial ecosystems (Forest: a~d; Grassland: e~g; Cropland: h~i). ●: observed values, △: estimated values.

The results demonstrate that the GSMSR model could well describe the seasonal dynamics of $R_s$ of different terrestrial ecosystems.
FIGURE S3 Comparison between measured \( R_{s,\text{monthly}} \) and simulated \( R_{s,\text{monthly}} \) of GSMSR model.

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y = 0.67x + 0.87 \quad R^2 = 0.68
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FIGURE S4 The spatial pattern of mean annual $R_s$ in China from 1995 to 2004.